Fermilab

Particle Physics Division
Mechanical Department Engineering Note

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Project Internal Reference:

Project: A-Frame Crane extensions shims for Coupp Muon Veto installation

Title: A-Frame Crane extensions shims

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Reviewer(s):

Key Words: A-frame crane

Abstract Summary: The A-frame crane used to install the Muon veto above the Coupp detector underground at MINOS is too short to safely perform the job. Two structural steel shim columns are designed to raise the crane beam up by 8 inches to provide adequate hook height to safely perform the installation

Applicable Codes: AISC 9th

FROM AISC 9th Edition, Chapter K.

Concentrated Load	3	kips
Fyw (minimum yield stress of the beam)	36	ksi
thickness of web, tw	0.3125	in
Length of bearing, N	8	inches
Overall depth of member, d	8	inches
Flange thickness, tf	0.5	inches
fillet radius, k	0.9375	inches
Clear Web depth, dc	6.125	inches
h, clear distance between flanges	7	inches
Flange width, bf	8	inches
Unbraced Length, l	8	inches

Formula K1-5
R=34*tw^2[1+3*(N/d)*(tw/tf)^1.5]*sqrt(Fyw*tf/tw))

R=	49.45242	kips

Formula K1-7
R =

(6800*(tw^3)/h)*(0.4*((dc/tw)/(l/bf))^3)	0.05	kips

0.05 kips << 3 kips, therefore, no good.

Conclusion: Beam needs stiffeners to take the 3 kip load
Use two steel plates, each 1/4" thick, 8 inches tall
and
6 inches wide welded to the ends of the wide flange section
to stiffen the beam and prevent web buckling.

Shim as Viewed from the floor.

Shim added to top of column and supporting the crane beam

Close up of shim with web stiffeners installed.